VIIRS Cloud Mask (VCM)
CCR 12-382
DR 4576

Dr. Thomas Kopp – VCM Validation Lead

Dr. William Thomas – VCM JAM

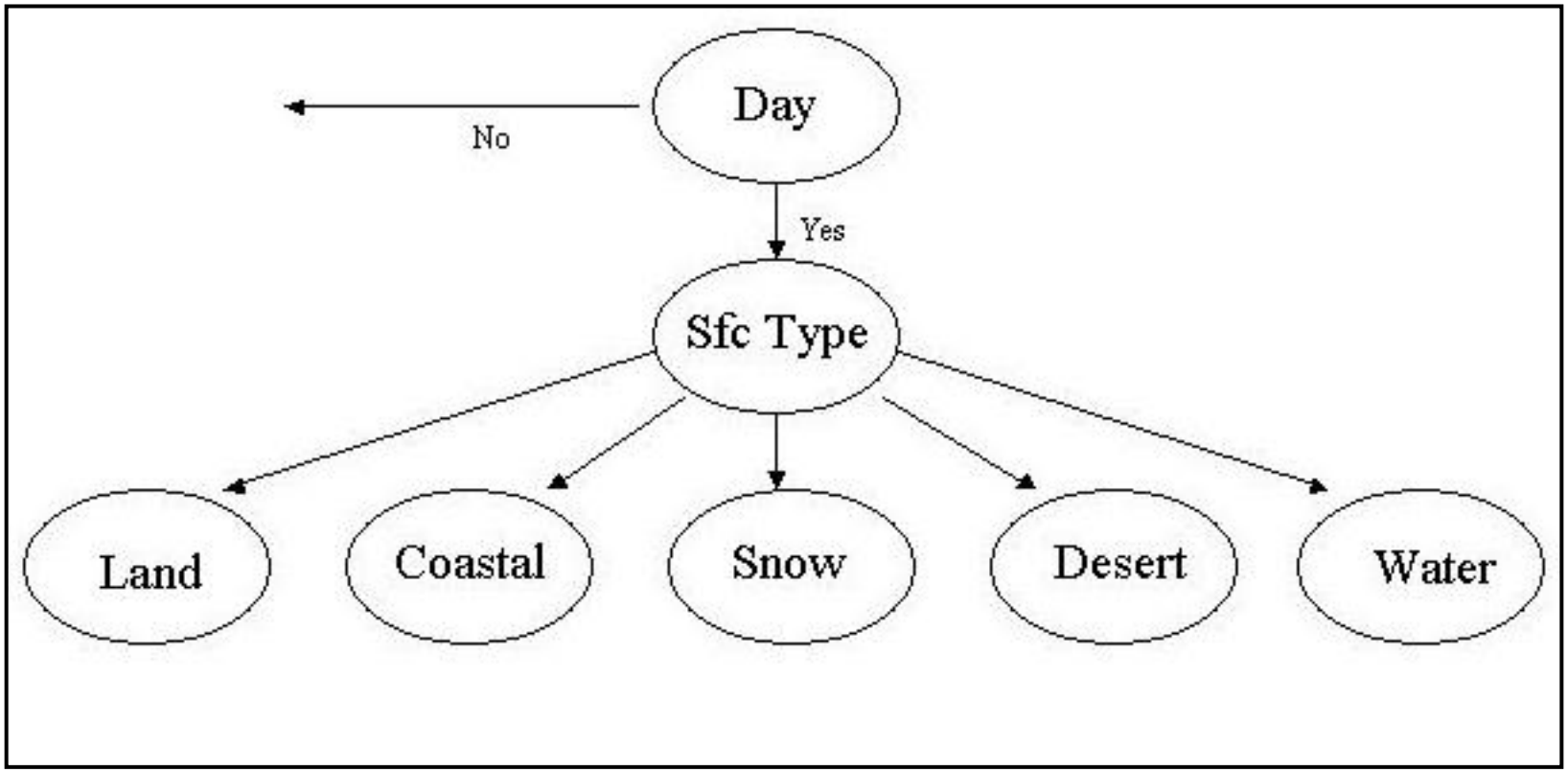
VCM 30 Day Spin Up Objectives

- Adjust VCM thresholds to mitigate obvious errors
  - This goes directly to this briefing
- Identify sub-optimal results where software changes will be necessary to correct/improve the VCM
- Identify external issues that negatively impact the VCM
- Begin development of “Golden Granules”
- Produce initial results from match-ups with CALIPSO
- Produce initial results from comparison with the MODIS cloud mask
- Establish beta performance

Brief summary of the VCM

- The VCM works in “branches”, where the cloud detection tests employed, and their associated thresholds, are tied to these branches
  - Day/Night
  - Ocean/Land/Desert/Snow/Coast
- One may therefore tune one branch without affecting others
  - There are over 2000 potential thresholds one could tune
- There are also thresholds for identifying snow, cloud phase, various aerosols, and ephemeral water

Daytime Branches



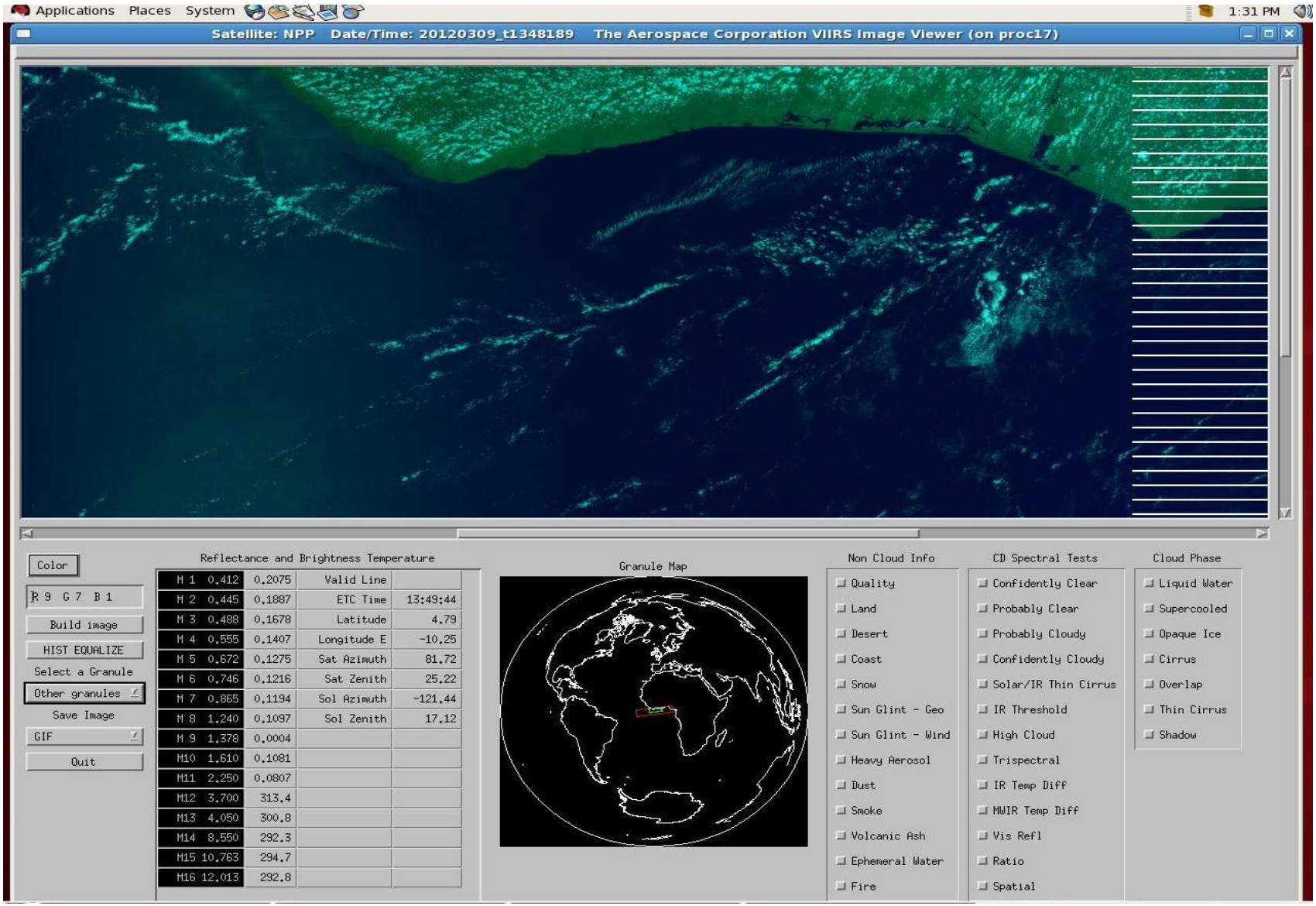
What We Did in 30 Days

- 74 thresholds were adjusted during the 30 day spin up
  - Objective of this summary is to obtain approval from the AERB to implement these thresholds
- 34 iterations of threshold changes were run on GRAVITE
- 4 Golden Granules were reprocessed on the G-ADA
  - This included quantitative analysis
- 1012 granules of VCM/MODIS/CALIPSO match-ups were produced
  - Quantitative analysis produced here as well

General Guidelines

- Minimizing leakage was our #1 objective
- If a “tradeoff” was necessary, play it conservative
  - This means ensuring clear was indeed confidently clear and allowing higher values of probably clear
  - Number of probably clear pixels was high at the start, it is better but may still be high over oceans
- Don’t spend a lot of time on items that cannot be tuned or have very complex dynamics
  - Primary background affected here was snow
- Perfect is the enemy of good

The Visualization Tool



Results Matching G-ADA (NG) and the IDPS

Comparisons for the four Golden Granules (GG)

Granule	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
GG#1	99.90%	99.93%	99.98%	99.81%	Spare	99.88%
GG#2	99.97%	99.92%	99.95%	99.95%	Spare	99.90%
GG#3	99.96%	99.94%	99.96%	99.91%	Spare	99.93%
GG#4	99.93%	99.95%	99.96%	99.88%	Spare	99.89%

DPE Functional Test Results

Comparisons of the ADL runs versus the G-ADA Functional Test

Granule	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Day	99.97%	99.95%	99.98%	99.96%	Spare	99.96%
Night	99.97%	99.99%	99.99%	99.96%	Spare	99.93%

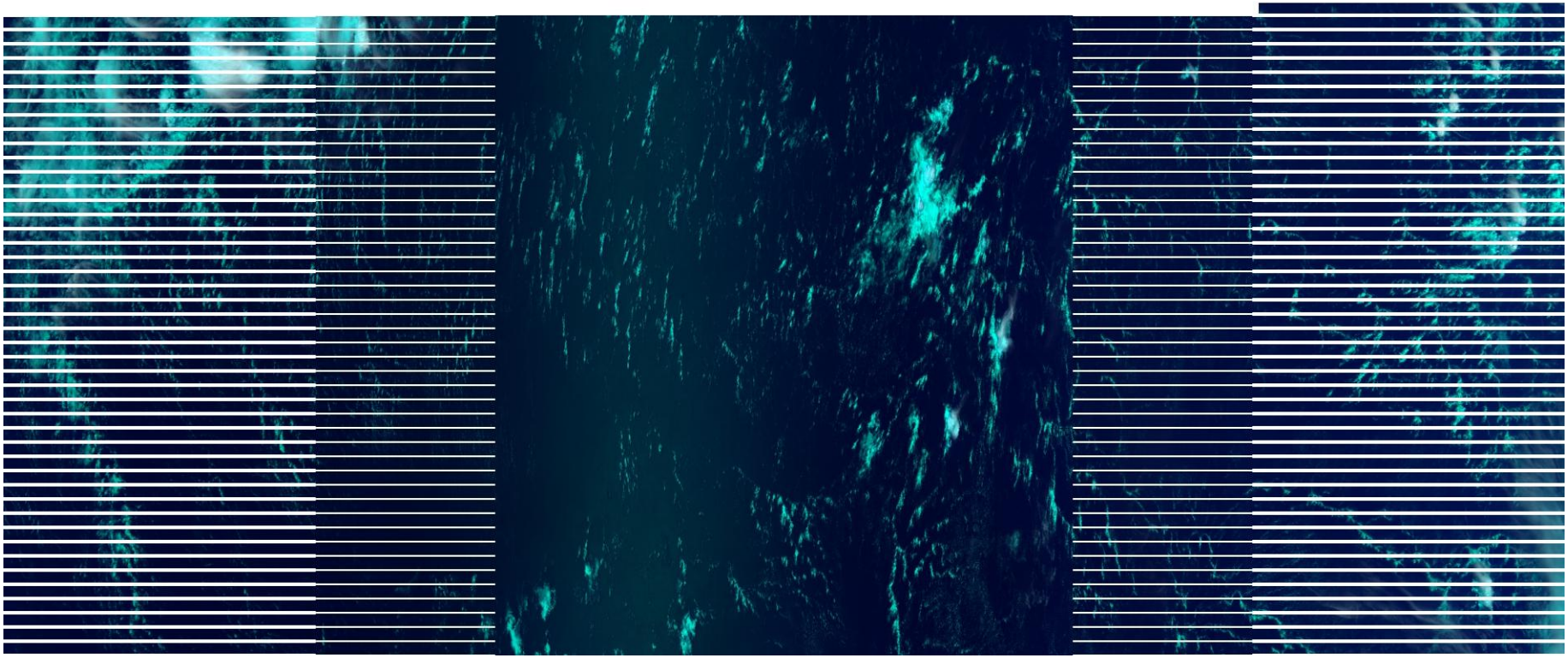
Results Matching VCM and CALIPSO

Global results

Cloud Mask	Sample Size	Cloud fraction				Probability of		
		Active	Passive	Pr. Clear	Pr. Cloudy	Detection	False D.	Leakage
IDPS	88240	0.7513	0.6915	0.0920	0.0515	0.9012	0.0195	0.0793
SSEC Pre-tuned	85650	0.7555	0.7006	0.0971	0.0490	0.8994	0.0228	0.0777
SSEC Phase 2	85650	0.7555	0.6915	0.0638	0.0238	0.9063	0.0148	0.0789
NOAA PATMOS-x VIIRS	90358	0.7507	0.7122	0.0343	0.0348	0.9257	0.0179	0.0564
MODIS C6	272635	0.7217	0.7151	0.0808	0.0333	0.9407	0.0264	0.0329
NOAA PATMOS-x MODIS	272635	0.7217	0.6793	0.0321	0.0254	0.9446	0.0065	0.0489

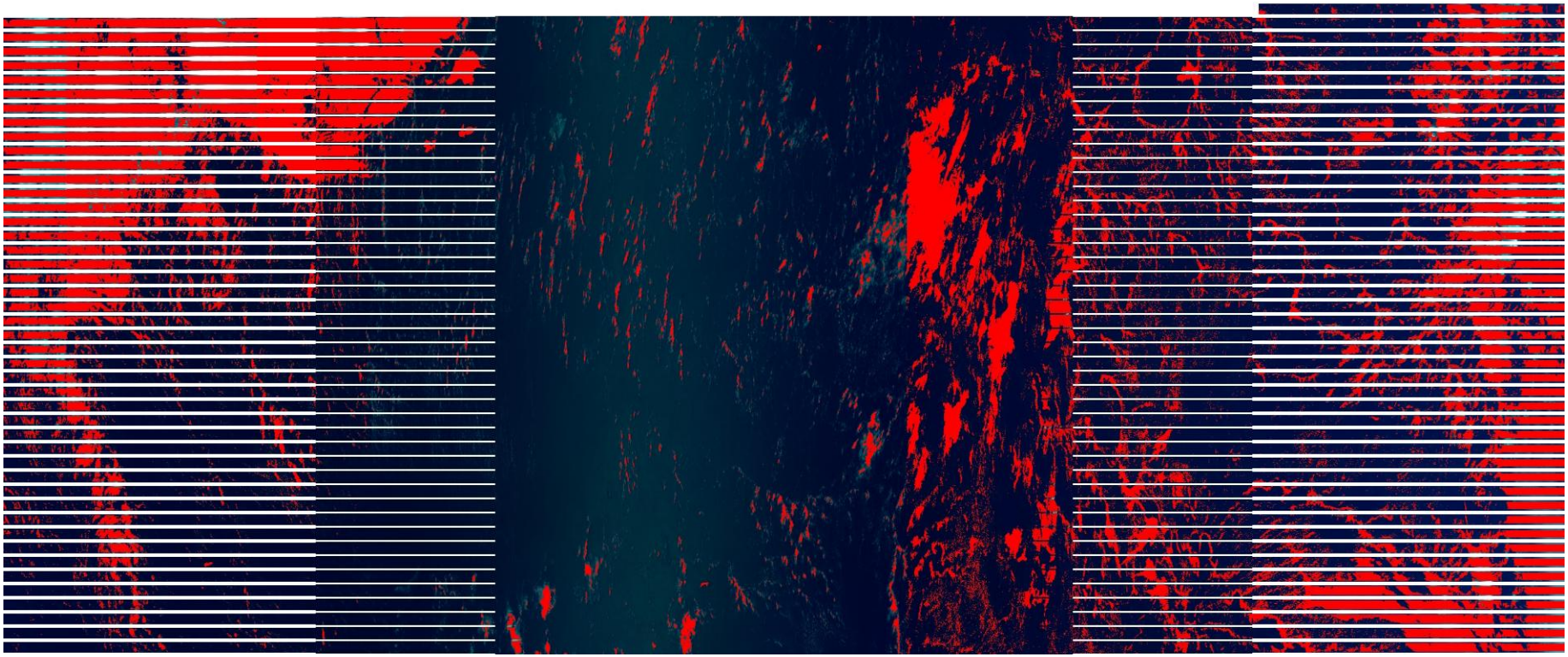
Example, East Atlantic

- Color Sequence is Red-9, Green-7, Blue-1



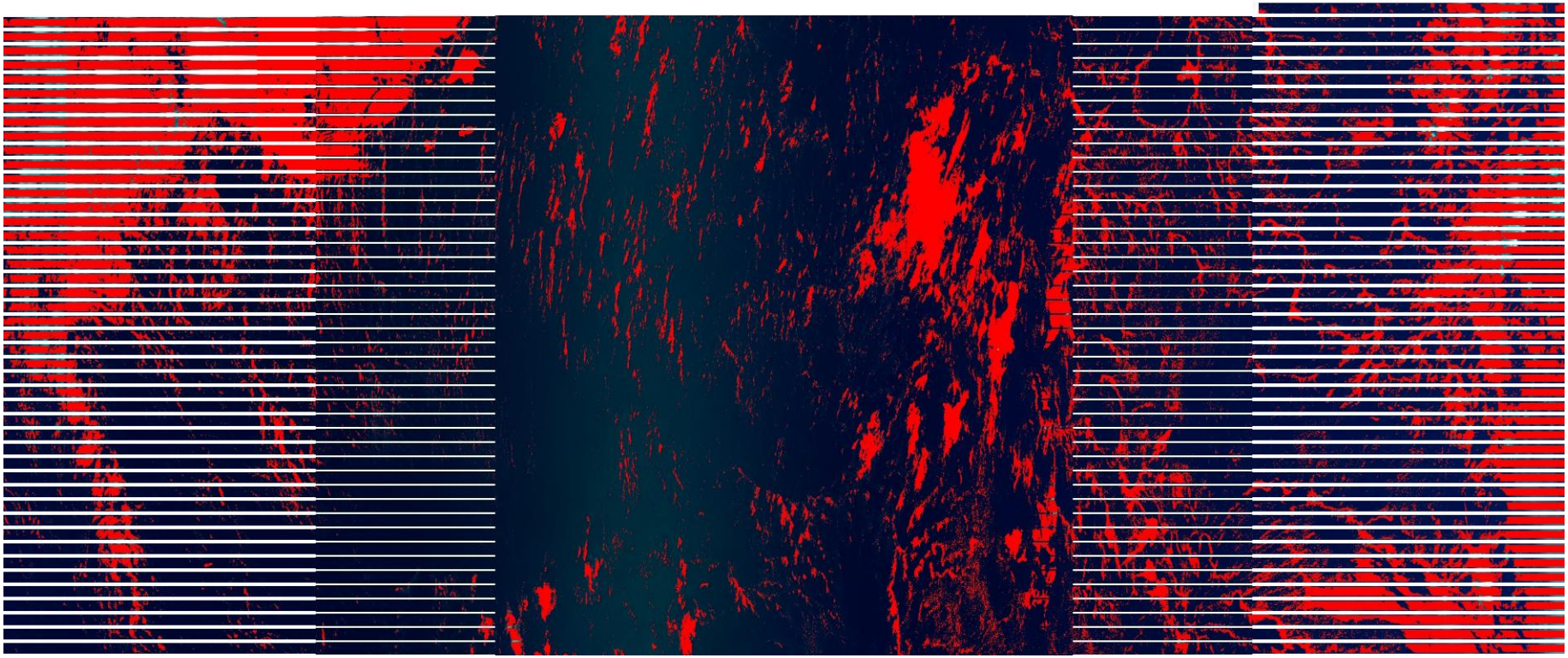
East Atlantic Conf. Cloudy Start

- Color Sequence is Red-9, Green-7, Blue-1



East Atlantic Conf. Cloudy End

- Color Sequence is Red-9, Green-7, Blue-1



East Atlantic Conf. Clear Start

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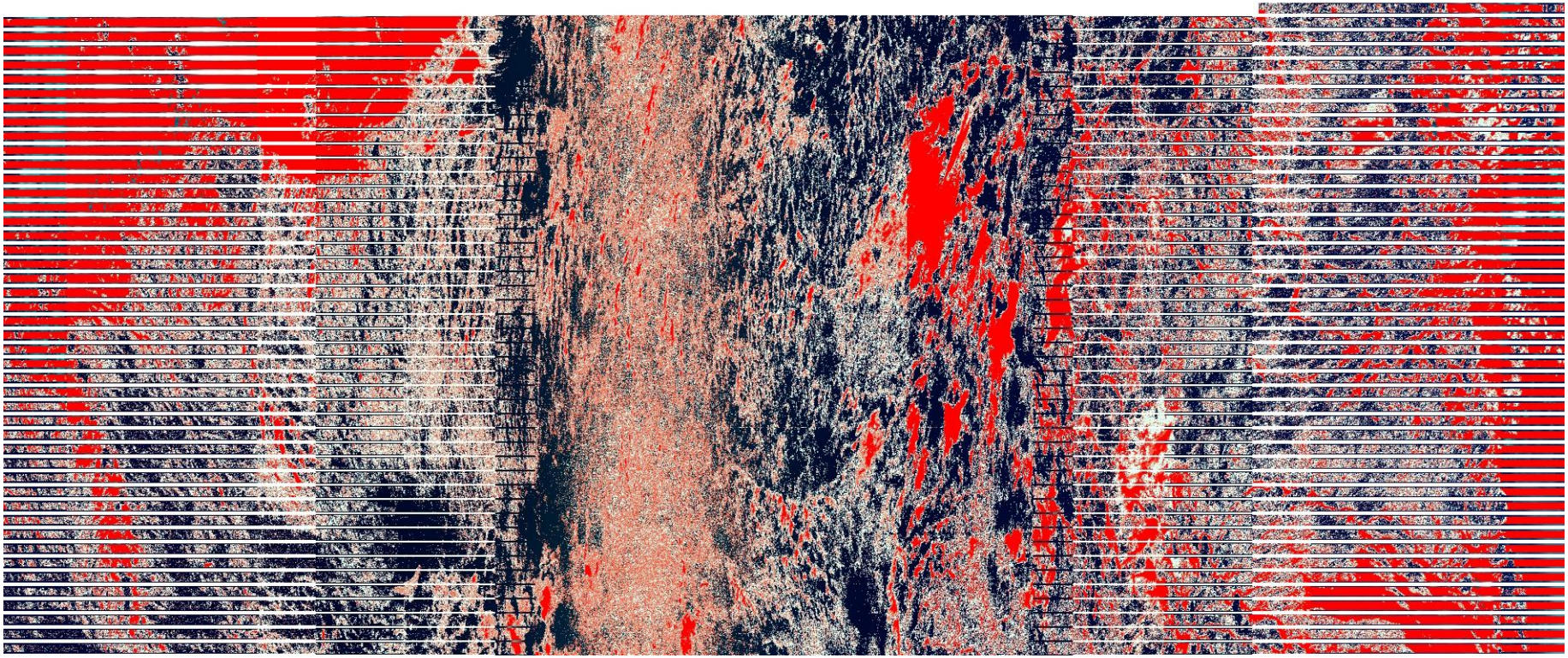

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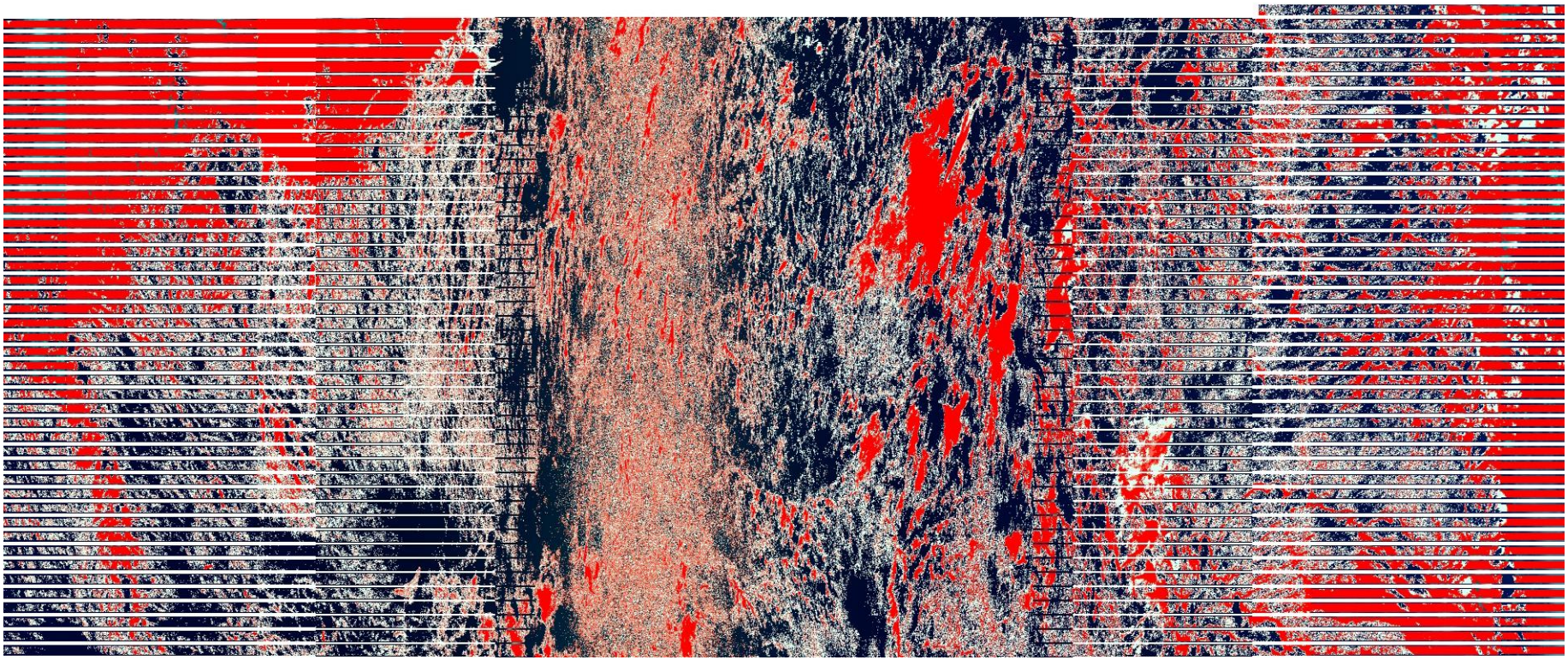
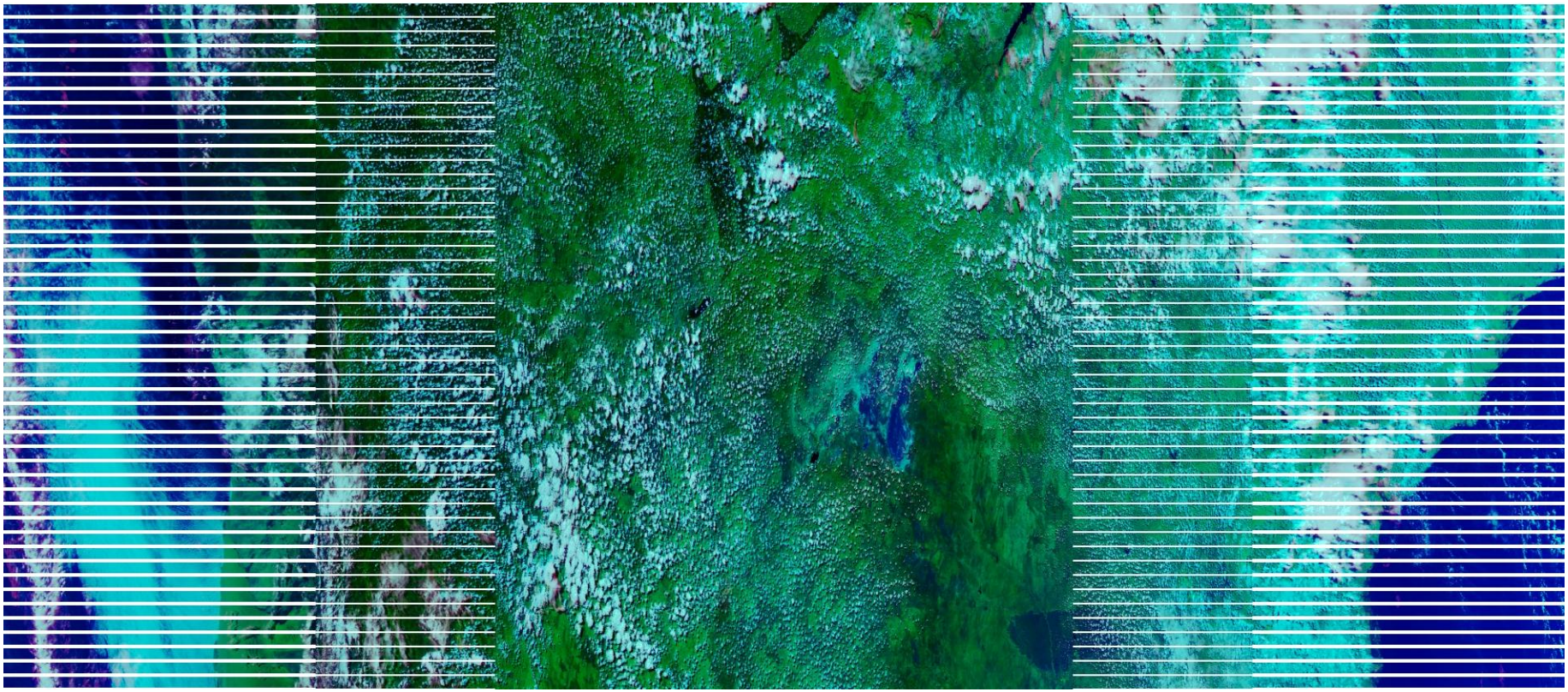


Example, South Africa

- Color Sequence is Red-9, Green-7, Blue-1
  - Histogram equalized



South Africa Conf. Cloudy Start

- Color Sequence is Red-9, Green-7, Blue-1
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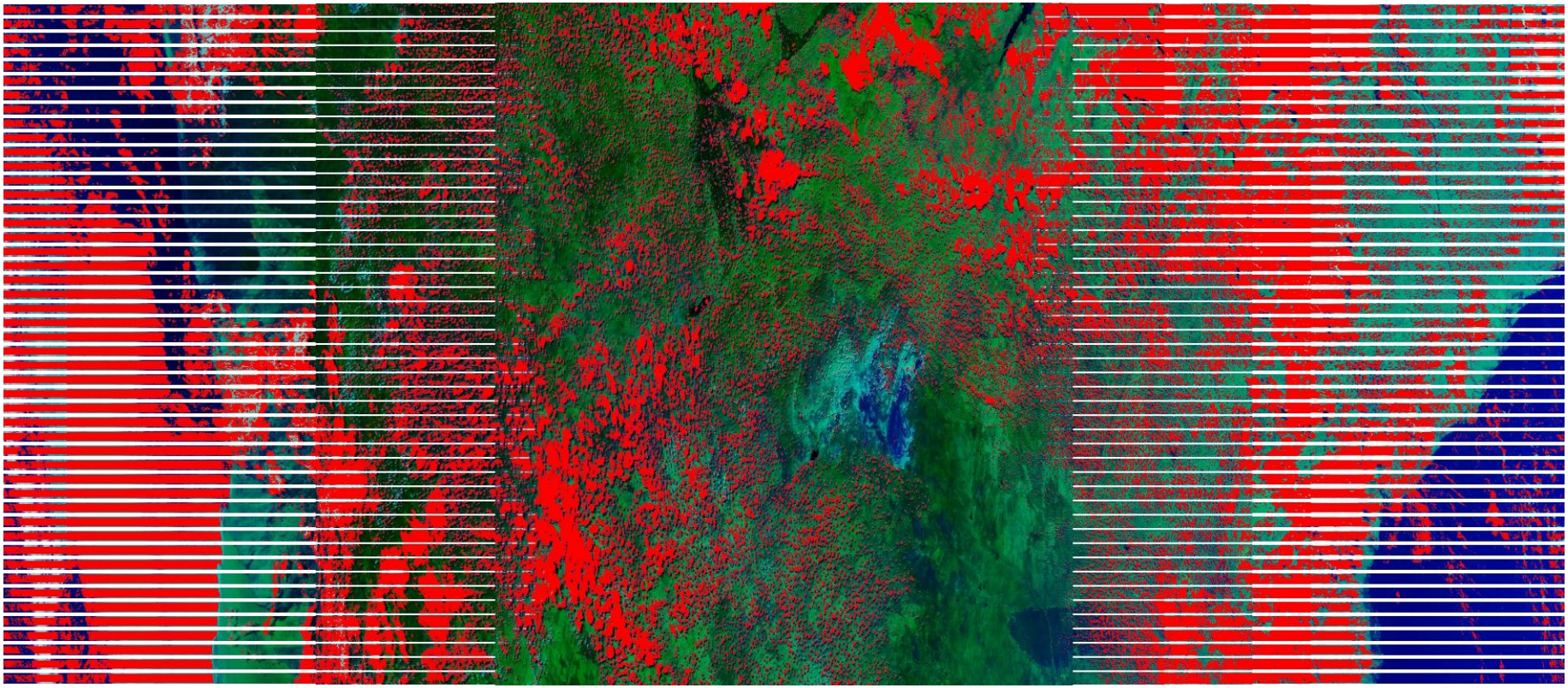

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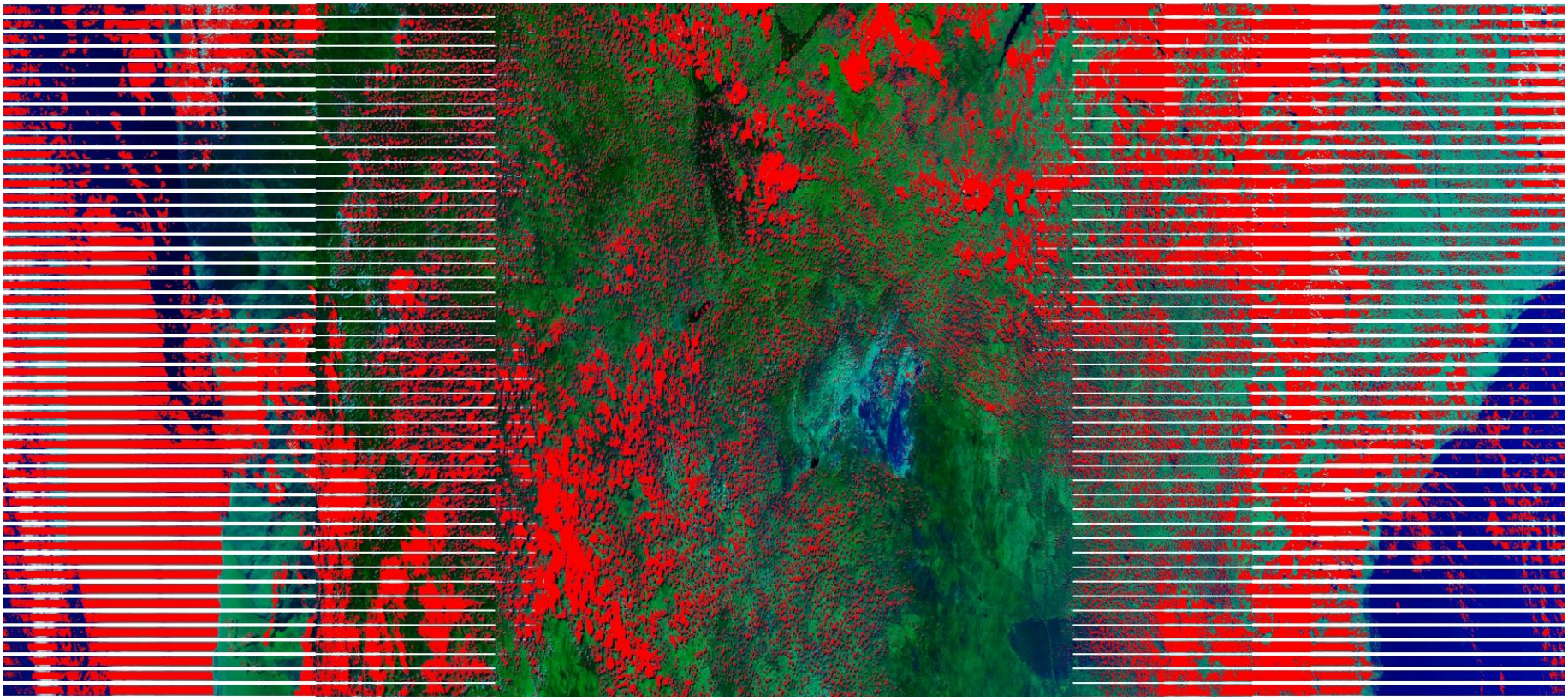

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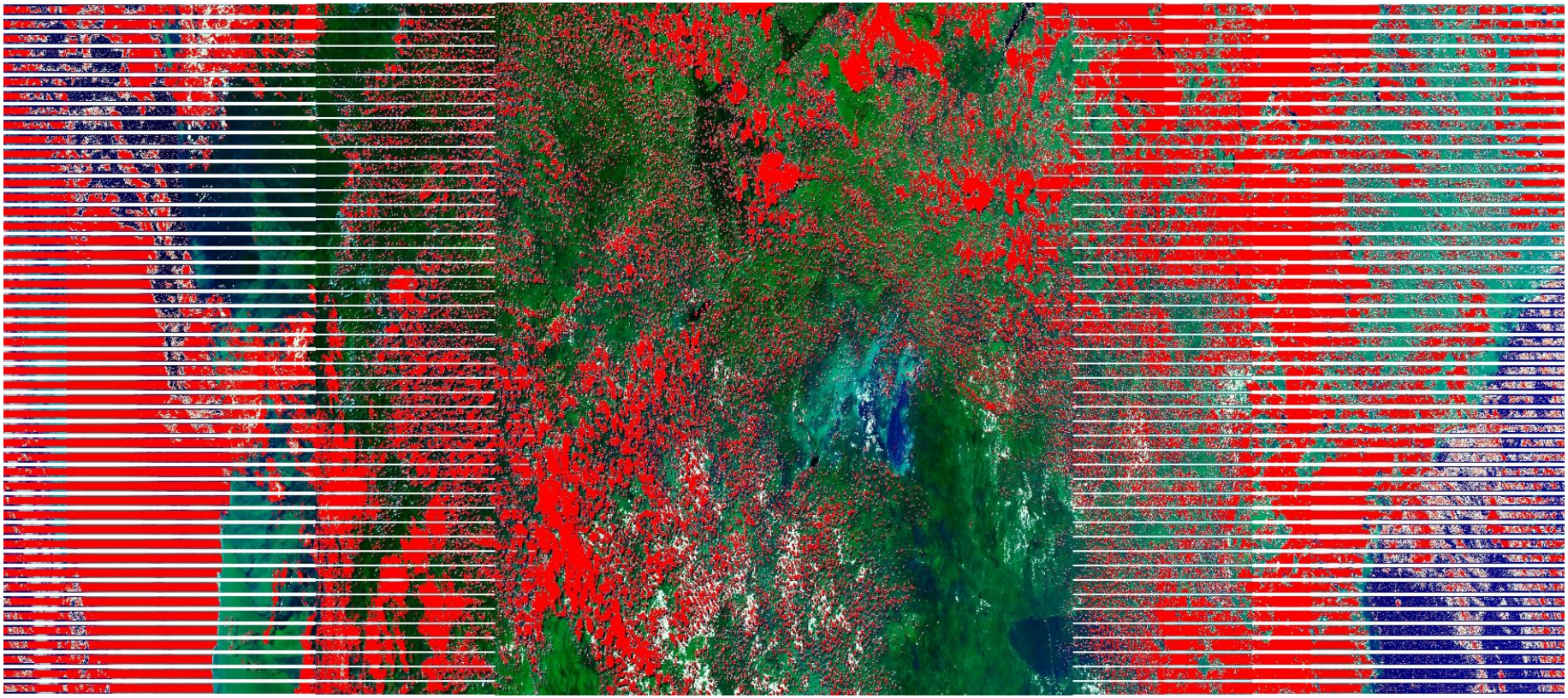

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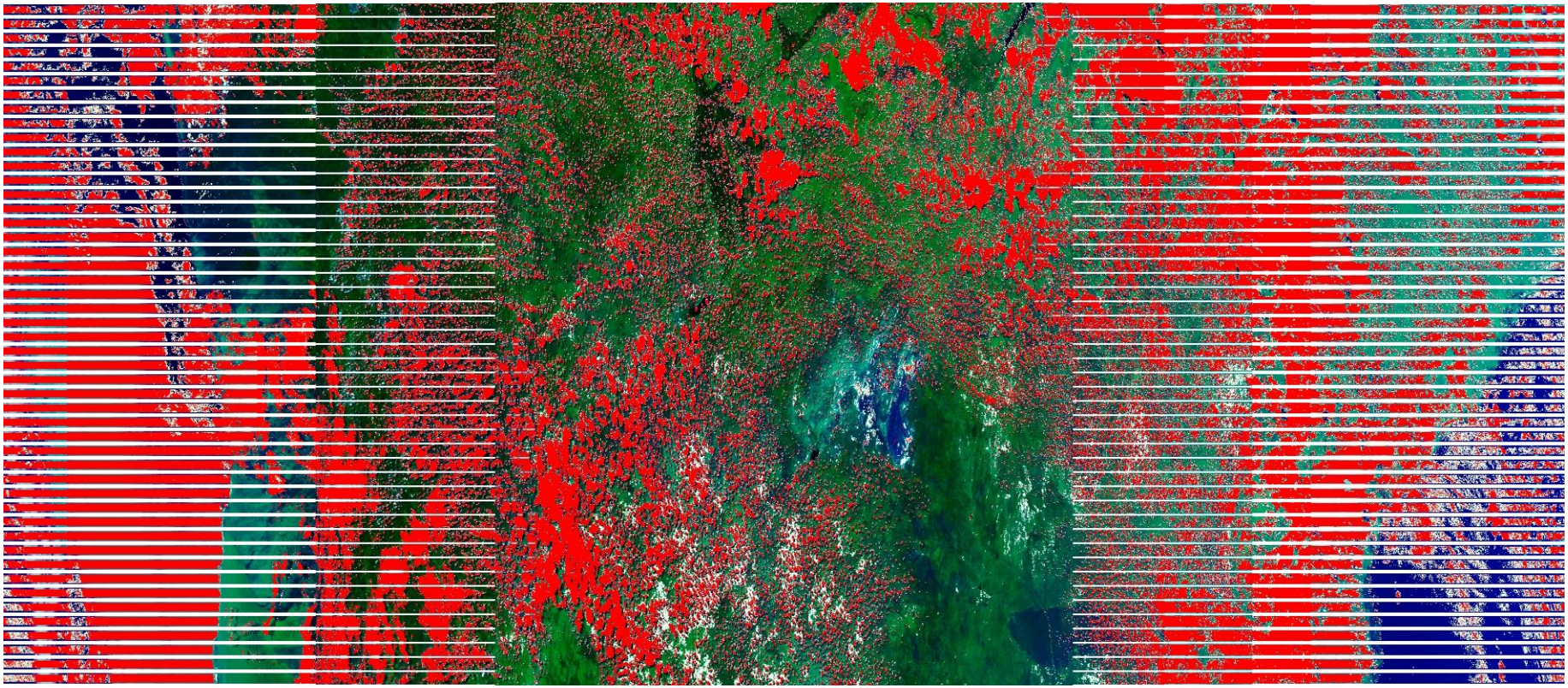
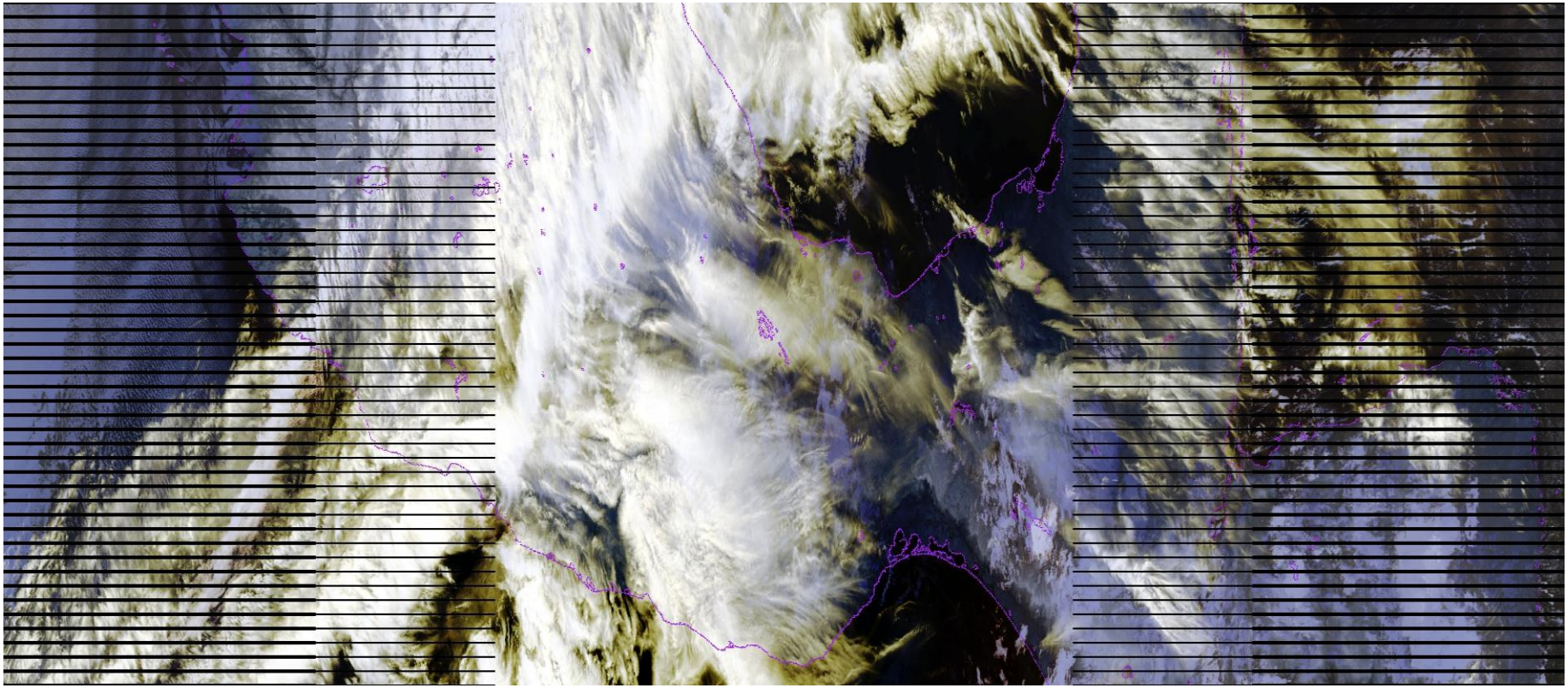


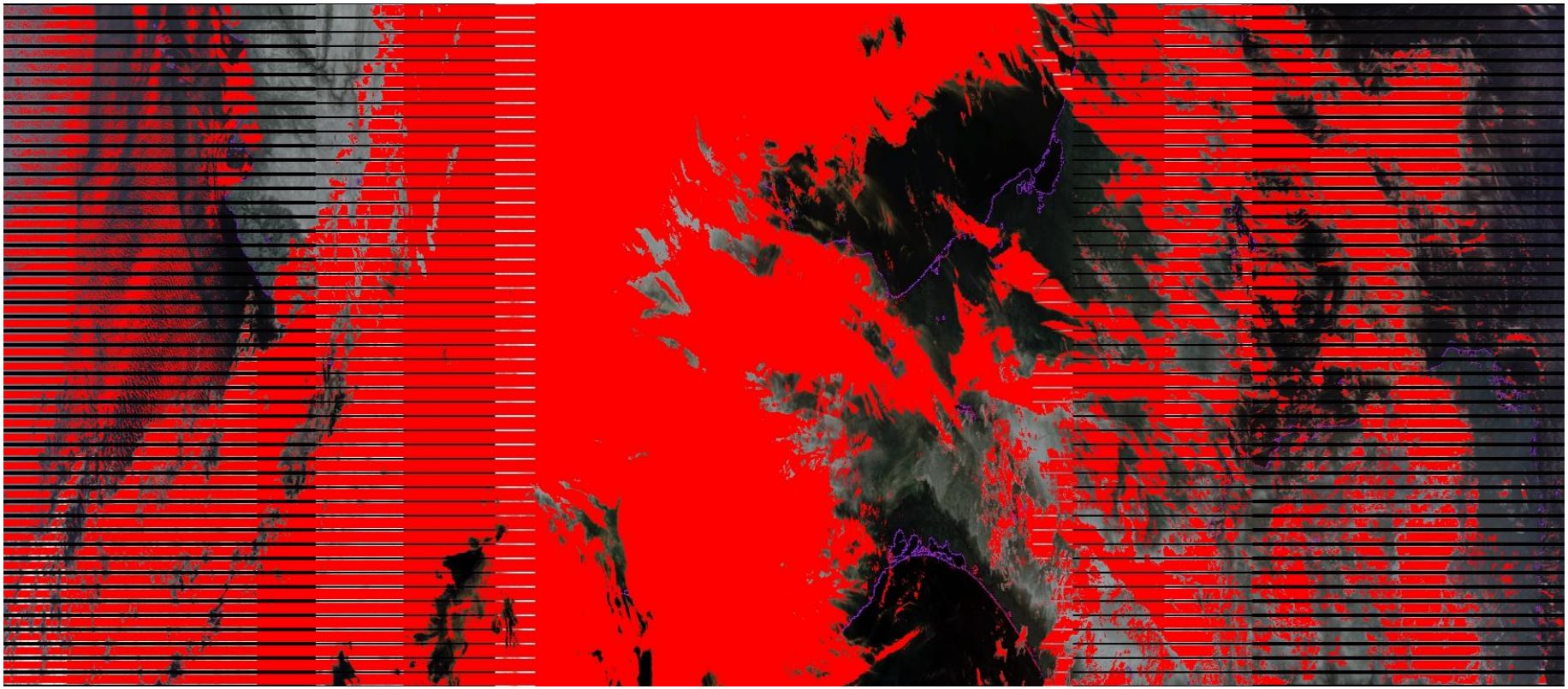
Example, Mexico Night

- Color Sequence is Red-16, Green-15, Blue-12
  - Histogram equalized



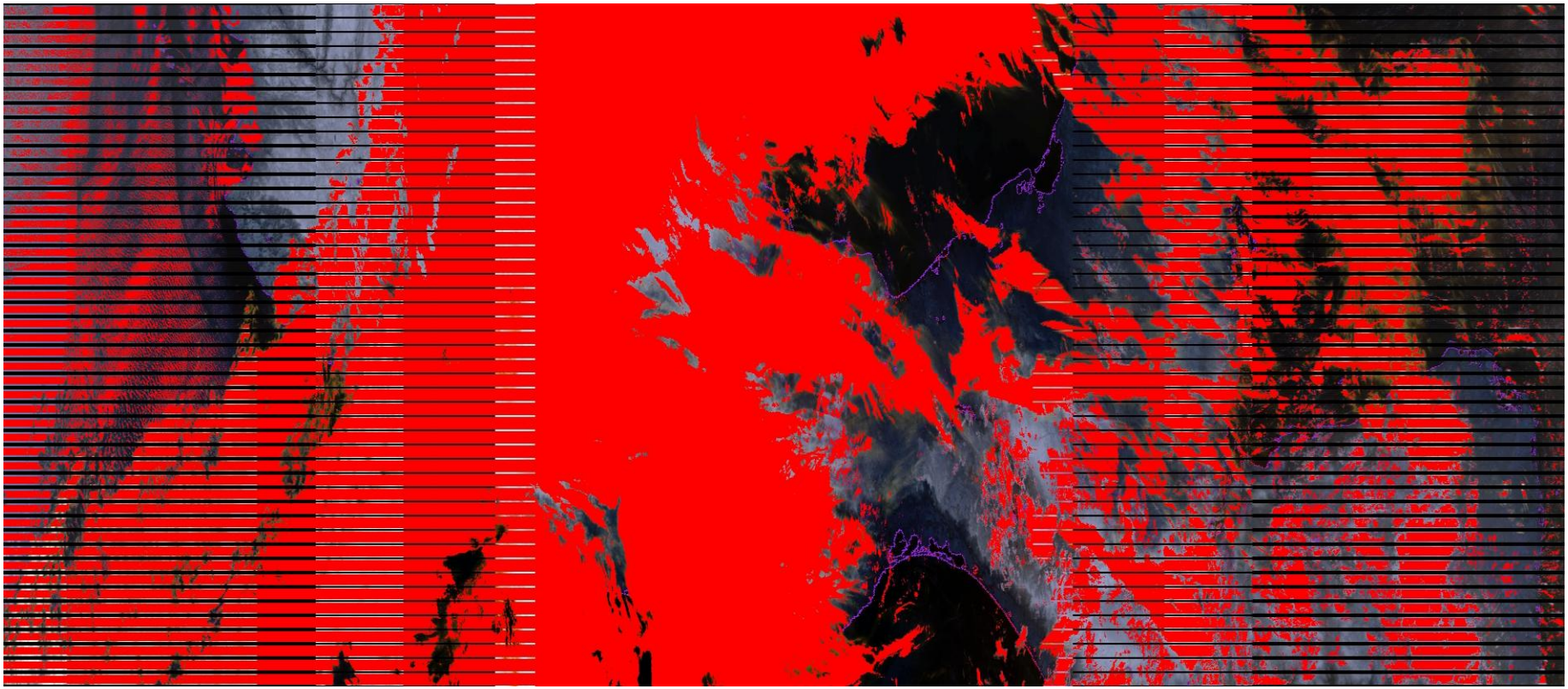
Mexico Night Conf. Cloudy Start

- Color Sequence is Red-16, Green-15, Blue-14
  - Histogram equalized



Mexico Night Conf. Cloudy End

- Color Sequence is Red-16, Green-15, Blue-14
  - Histogram equalized



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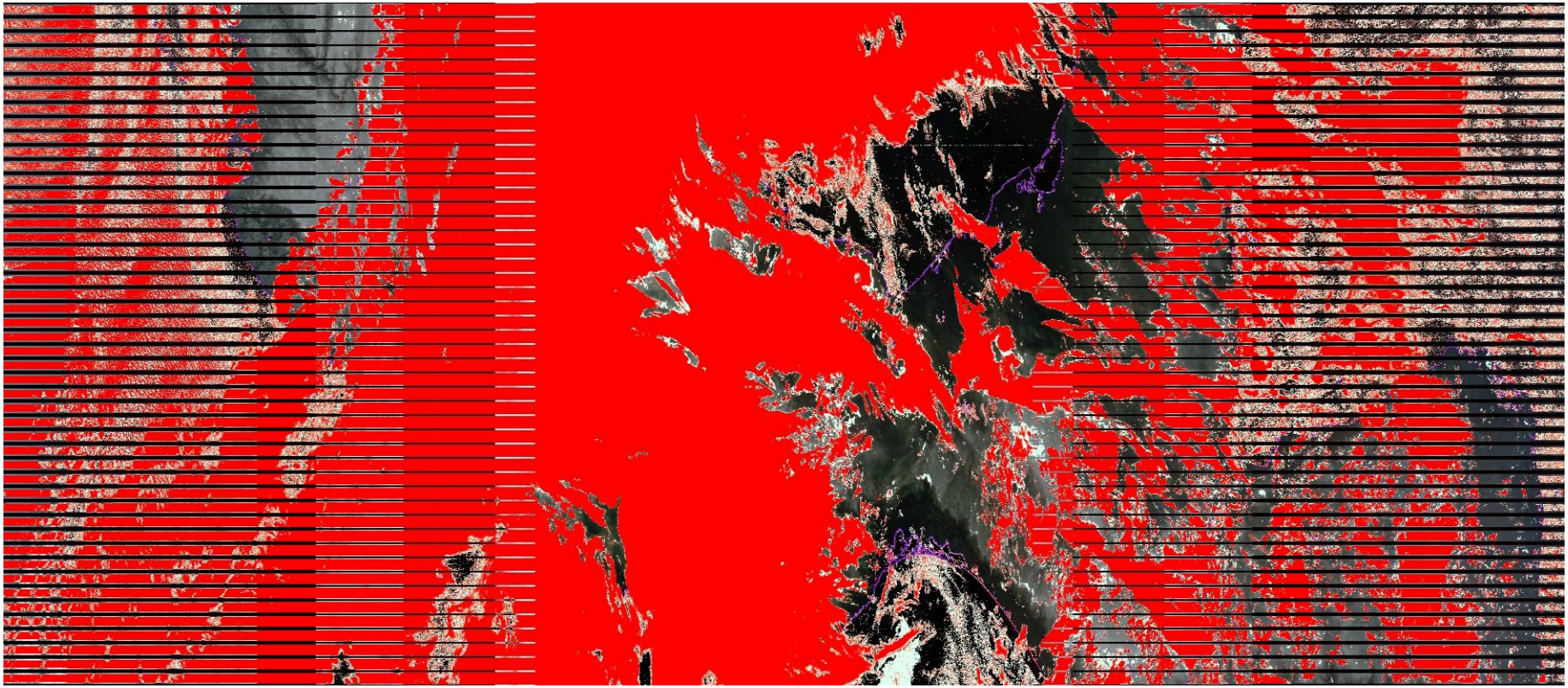

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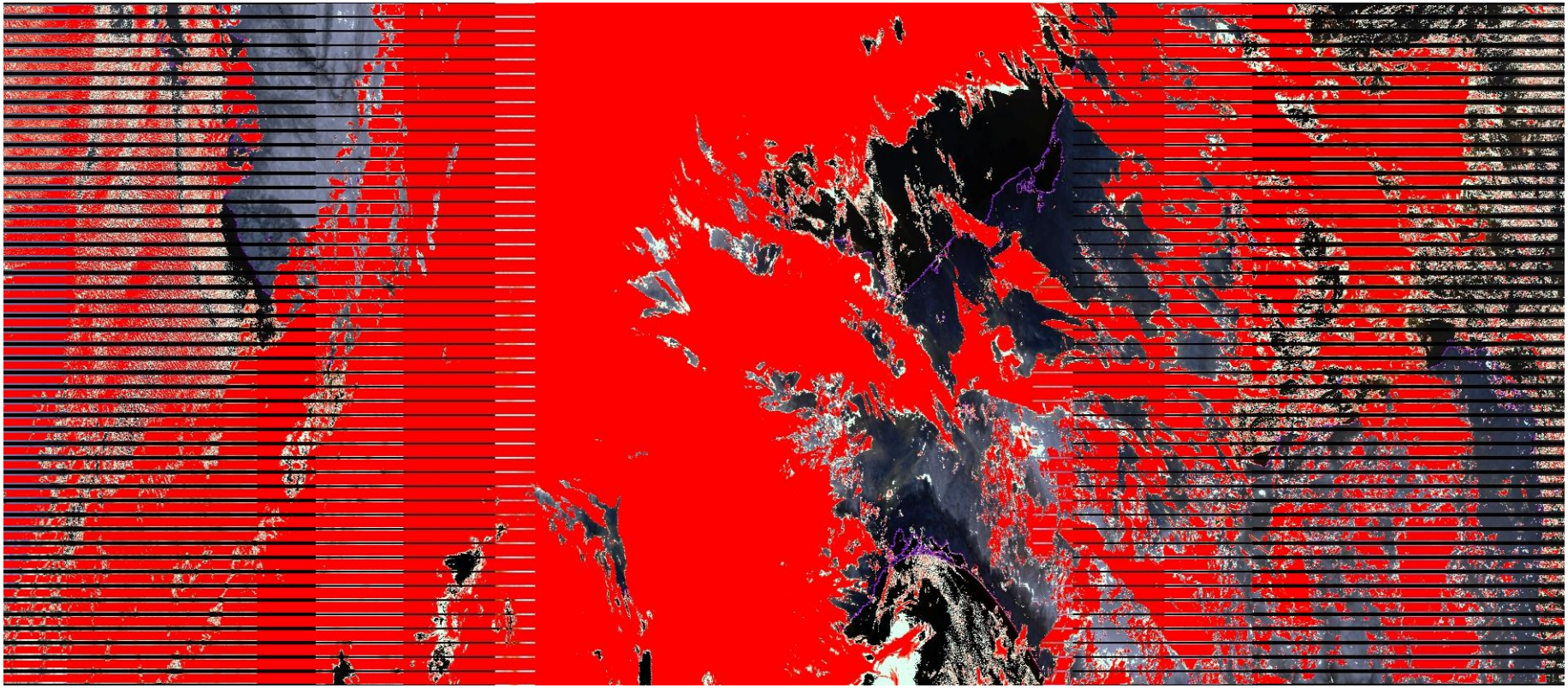

Beta Definition

- Early release product
- Initial calibration applied
- Minimally validated and may still contain significant errors
- Available to allow users to gain familiarity with data formats and parameters
- Product is not appropriate as the basis for quantitative scientific publication studies and applications

Beta Evaluation

- Early release product
  - VCM has been validated for only a 30 day period
  - VCM is already being evaluated for its impacts on other EDRs
    - Other teams understand VCM is in its early stages
- Initial calibration applied
  - As just noted, first set of tuning updates is ready for implementation
  - No software changes have yet been made to the VCM

Beta Evaluation

- Minimally validated and may still contain significant errors
  - Certain backgrounds and cloud types have not been tuned
  - Flags for cloud phase and aerosols have yet to be evaluated by the VCM team
- Available to allow users to gain familiarity with data formats and parameters
  - Documentation is correct regarding format and output parameters (bit flags)
  - Some in the community need to gain more familiarity with the VCM output flags (i.e. quality flags)

Beta Evaluation

- Product is not appropriate as the basis for quantitative scientific publication studies and applications
  - Many of the other Cal/Val teams at the recent Workshop identified concerns with the VCM
  - Results using pre-launch thresholds have varied from decent (Land) to sharply negative (SST)

Beta Considerations

- VCM has met the beta stage based on the definitions and the evidence shown
  - This is the case based on the updated thresholds
- Remaining issues are known and at least a preliminary way ahead has been established
  - Most have DRs, what remains will be written as needed
- Understand some items still need to be completed
  - Submission of findings
  - Actual implementation of the updated thresholds
- Looking for contingency approval to declare beta in early/mid May dependent on the actual date of implementation

Finishing Slide

- These represent “typical” cases we observed during the 30 day period
  - Most granules appeared reasonable to start with small but obvious errors in isolated locations
  - Most were mitigated with leakage minimized
- Results show improvements across all scene types tested over the 30 day period
- Thresholds are ready for placement on the IDPS
- VCM meets the definition of beta stage once these thresholds are implemented